

CEMP-RT

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
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ETL 1110-1-176

Technical Letter
No. 1110-1-176

28 JUNE 1996

Engineering and Design
BIOREMEDIATION USING LANDFARMING SYSTEMS

1. Purpose. This engineering technical letter (ETL) was written to provide guidance for designers on how to properly design, specify and operate appropriate landfarming treatment systems for the purpose of biodegrading organic wastes.

2. Applicability. The engineering and design procedures are applicable to projects on Hazardous and Toxic Wastes Sites, Department of Defense Sites, or for other Federal Agencies for which the U.S. Army Corps of Engineers is the responsible design agent.

3. References.

- a. ER 1110-345-100 Design Policy for Military Construction.
- b. ER 1110-345-700 Design Analysis.
- c. ER 1110-345-720 Construction Specifications.
- d. For other specific references see Appendix C.

4. Discussions. The attached appendices present the procedures and considerations associated with the engineering and design of the Landfarming treatment process, including:

a. Appendix A - Design Considerations. The information presented in this appendix provides a comprehensive overview of design and engineering considerations for landfarming:

(1) Background information, theory, principles of operations for waste/soil bioremediation processes, and definitions.

(2) A summary of landfarming applicability, a comparison with other treatment options, and typical operating performance.

(3) A summary of regulatory requirements and permits for typical sites.

(4) Waste characterization and. treatability study requirements.

(5) Historical performance data and relative effects of climatological and operational parameters on site performance.

(6) An overview of design considerations from site selection through facilities construction, and specific design

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considerations for components of the landfarming system and associated accessories and auxiliary systems.

- (7) Facility sizing criteria and considerations.
 - (8) Process operation and maintenance considerations.
 - (9) Sampling and verification procedures for determining any required changes in operational procedure and determining the effectiveness of the process.
 - (10) Construction materials and installation considerations.
 - (11) Utility and support service considerations.
 - (12) Closure requirements for completed operations and post closure care and monitoring requirements.
 - (13) Design and construction package requirements.
- b. Appendix B - List of Abbreviations. Presents a list of commonly used abbreviations and acronyms.
 - c. Appendix C - Bibliography. provides references and sources of information for the design considerations presented throughout the ETL.
 - d. Appendix D - Design Example. Presents a summary of the design approach for landfarming applications and an illustrative design example.

5. Action. This information will be used by USACE personnel responsible for design and review of HTRW projects utilizing landfarming technology. It is strongly recommended that input be sought from the appropriate technical staff for all phases of scoping, design, and construction of a landfarm. The involvement of in-house technical expertise is essential to providing a cost effective, high quality service to the customer.

FOR THE DIRECTOR OF MILITARY PROGRAMS:



Appendix A - Design Considerations
Appendix B - List of Abbreviations
Appendix C - Bibliography
Appendix D - Design Example

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